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(71)Applicant : MATSUSHITA ELECTRIC WORKS LTD

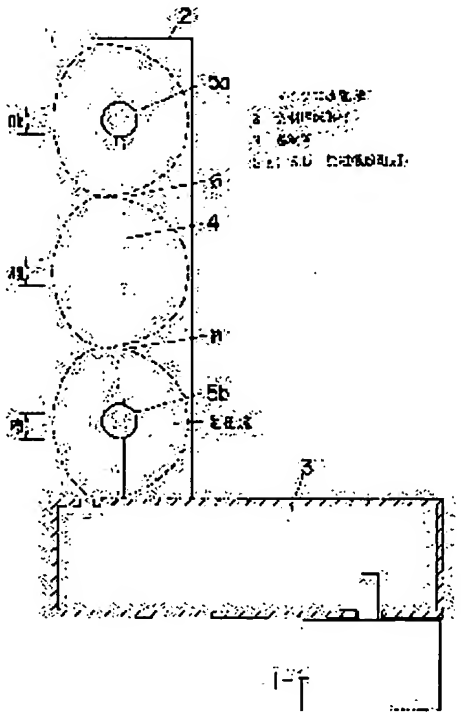
(72)Inventor : KAMIOKA ATSUSHI
SAIMI MOTOHIRO
KOBAYASHI ATSUSHI

(54) MICROWAVE ELECTRODELESS DISCHARGE LAMP DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a microwave electrodeless discharge lamp device which is easy to re-start and can make one desired lamp among two or more electrodeless electric discharge lamps turn on with easy composition.

SOLUTION: The device is provided with a microwave power supply 1, a cavity component member 2 which makes a standing wave by microwave generate in its inside, and lamps 5a and 5b arrange at the portion of the antinode of the above standing wave. The energy by the standing wave can be applied efficiently concentrating it on the lamps 5a and 5b. The lamp 5a, which is easy to start operation, can be made turn on easily previously. When generating the microwave again immediately after switching off the lamp 5a, only the one lamp of the lamp 5b can be made to turn on and the re-starting can be made easy. Moreover, by making the microwave from the microwave power supply 1 generate intermittently, and making the lamps 5a and 5b turn on lighting one by one, one desired lamp among the lamps 5a and 5b can be made to turn on with easy arrangement.



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* NOTICES *

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to microwave electrodeless discharge LGT equipment.
[0002]
[Description of the Prior Art] Conventionally it has the electrodeless discharge LGT (henceforth a "lamp") which has two or more discharge space, and the microwave electrodeless discharge LGT equipment which makes one LGT of the arbitration of them turn on is offered by using said two or more discharge space as the lamp which became independent, respectively (refer to JP,11-67159,A).
[0003] With the above-mentioned conventional microwave electrodeless discharge LGT equipment, RF electromagnetic field are impressed to the whole lamp with an induction coil, and the life of the lamp which has n discharge space is made the n times as many abbreviation for the life of a lamp which has one discharge space as this according to making one LGT turn on among two or more discharge space as mentioned above. Moreover, mutually different gas is enclosed with each discharge space, if discharge space is chosen and the light is made to switch on, it will be alike, and optical properties, such as a color temperature, are made adjustable more with one lamp.
[0004]
[Problem(s) to be Solved by the Invention] However, with the above-mentioned conventional microwave electrodeless discharge LGT equipment, since electromagnetic field were impressed to the whole lamp which has two or more discharge space with the induction coil, the energy of electromagnetic field distributes to each discharge space, and it was hard to concentrate it, and in order to concentrate energy on desired discharge space and to switch it on, there was a problem of requiring the start-up auxiliary means which impresses a high voltage pulse to said discharge space.
[0005] Moreover, a lamp is a high intensity discharge lamp (HID lamp), and the starting voltage of a lamp carries out proportionally [abbreviation] at the vapor pressure within luminescence. For this reason, when discharge space of a lamp was set to one, even if it could centralize the energy of electromagnetic field on said discharge space, since the temperature of a lamp was high immediately after putting out lights of a lamp and the vapor pressure within luminescence also had it to it, unless starting voltage became high, and it put out the light and waited several minutes, it could not restart, but there was a problem that the restart immediately after putting out lights became difficult. [high]
[0006] The microwave electrodeless discharge LGT equipment which this invention is [equipment] easy to restart for the purpose of solution of the above-mentioned trouble, and makes one desired LGT turn on with an easy configuration among two or more electrodeless discharge LGTs is offered.
[0007]
[Means for Solving the Problem] In order to attain the above-mentioned object, invention of claim 1 The microwave power source which generates microwave and is supplied as a power source, and the cavernous configuration member which makes the interior generate a standing wave by the microwave generated from the microwave power source, By having been characterized by having two or more electrodeless discharge LGTs arranged by the part of the antinode of said standing wave, and having arranged two or more electrodeless discharge LGTs in the part of the antinode of a standing wave When generating microwave from a microwave power source It can concentrate on each electrodeless discharge LGT, and the energy by microwave can be impressed efficiently. Only one LGT can make the electrodeless discharge LGT which is the easiest to put into operation among two or more electrodeless discharge LGTs turn on easily previously. When generating microwave from a microwave power source again immediately after making said

electrodeless discharge LGT switch off While only one LGT can make a comparatively low electrodeless discharge LGT able to turn on and the vapor pressure different from said electrodeless discharge LGT with which the vapor pressure within luminescence became high by having switched on the light within luminescence can make restart easy By making it generate intermittently, microwave from a microwave power source so that said restart may be repeated By carrying out sequential burning of one every LGT of two or more electrodeless discharge LGTs, being able to make a desired electrodeless discharge LGT turn on with an easy configuration, without requiring a start-up auxiliary means like the conventional example, and making only one LGT turn on among two or more electrodeless discharge LGTs The life of a synthetic electrodeless discharge LGT can be lengthened.

[0008] In invention of claim 1, by being characterized by generating the standing wave which has one antinode in a cavernous configuration member, and setting the antinode of a standing wave to one, invention of claim 2 can make magnitude of a cavernous configuration member min, and can attain the miniaturization of the whole equipment.

[0009] Invention of claim 3 generates the standing wave which has two antinodes in a cavernous configuration member in invention of claim 1. While being able to stop the magnitude of a cavernous configuration member comparatively small and being able to attain the miniaturization of the whole equipment by being characterized by arranging an electrodeless discharge LGT in the part of each antinode, and setting the antinode of a standing wave to two By having arranged the electrodeless discharge LGT in the part of each antinode of a standing wave, a luminous-intensity-distribution property can be changed from the difference in the location of the electrodeless discharge LGT turned on for every antinode a lot than invention of claim 2.

[0010] Invention of claim 4 receives two or more electrodeless discharge LGTs in invention [which / of claims 1-3]. It is characterized by changing mutually at least one of the amounts of the magnitude of an arc tube, the construction material of an arc tube, the enclosure object within luminescence, and said enclosure object, and you can make it able to turn on one LGT of said two or more electrodeless discharge LGTs at a time, and optical properties, such as a color or a color temperature, color rendering properties, lamp efficiency, and an optical output, can be made adjustable.

[0011] In invention [which / of claims 1-4], invention of claim 5 to any or two electrodeless discharge LGTs by having been characterized by making some arc tubes share mutually, and having made some arc tubes share mutually among two or more electrodeless discharge LGTs Even if it can bring close and arrange said two electrodeless discharge LGTs, without leaving a clearance, consequently you make it turn on one LGT of each of said two electrodeless discharge LGTs at a time, a luminous-intensity-distribution property can be maintained at abbreviation regularity.

[0012] Invention of claim 6 is set to invention [which / of claims 1-4]. Among two or more electrodeless discharge LGTs within [of at least one electrodeless discharge LGT] luminescence other electrodeless discharge LGTs -- storing -- the core of said two electrodeless discharge LGTs -- abbreviation -- having arranged in the same location -- the description -- carrying out -- the core of said two electrodeless discharge LGTs -- abbreviation -- by having arranged in the same location Even if you make it turn on one LGT of each of said two electrodeless discharge LGTs at a time, a luminous-intensity-distribution property can be maintained at abbreviation regularity.

[0013] A storage means by which invention of claim 7 memorizes each sequence of two or more electrodeless discharge LGTs which is easy to put into operation in invention [which / of claims 1-6], It has the control means which controls a microwave power source. Said control means If directed to make a predetermined electrodeless discharge LGT turn on, based on said sequence memorized by the storage means It distinguishes that it is the electrodeless discharge LGT which said electrodeless discharge LGT tends to put into operation to the n-th. A microwave power source is made to generate microwave intermittently so that which electrodeless discharge LGT may turn on and switch off only a time (n-1). Then, only by a user directing a desired electrodeless discharge LGT to a control means by having been characterized by generating microwave and making said predetermined electrodeless discharge LGT turn on, and having equipped the microwave power source with said storage means and control means again In order to carry out sequential burning of one every LGT of two or more electrodeless discharge LGTs, time and effort which operates a microwave power source can be saved, and a desired electrodeless discharge LGT can be made to turn on easily each time.

[0014] A burning detection means by which invention of claim 8 detects burning of at least one predetermined electrodeless discharge LGT in invention [which / of claims 1-6], It has the control means which controls a microwave power source. Said control means So that which electrodeless discharge LGT may light up and put out the light, until said burning detection means detects burning By having been characterized by generating microwave

intermittently from a microwave power source, and having had said burning detection means and control means When a user makes a desired electrodeless discharge LGT turn on, in order to carry out sequential burning of one every LGT of two or more electrodeless discharge LGTs, time and effort which operates a microwave power source can be saved, and a desired electrodeless discharge LGT can be made to turn on easily each time.
[0015]
[Embodiment of the Invention] As this operation gestalt is shown in drawing 1 R> 1, two electrodeless discharge LGTs 5a and 5b (henceforth a "lamp"), (Operation gestalt 1) The microwave power sources 1 which generate microwave and supply microwave to Lamps 5a and 5b as a power source, such as a magnetron, It has the waveguide 3 which transmits the microwave generated from the microwave power source 1, and the cavernous configuration member 2 which makes the interior generate the standing wave (dotted line shown in drawing 1) which has three antinodes by the microwave transmitted from the waveguide 3.
[0016] The cavernous configuration member 2 is formed approximately cylindrical [an owner bottom] with the conductive mesh raw material reflected without penetrating the light from [the great portion of] Lamps 5a and 5b, and penetrating the microwave introduced from the waveguide 3. And if microwave is introduced in this cavernous configuration member 2, a standing wave will occur by reflecting in the wall of the cavernous configuration member 2 in the resonance frequency of the abbreviation integral multiple (drawing 1 3 times as many abbreviation as this) of (C/2L). L shows the die length of the travelling direction of the microwave in the cavernous configuration member 2 interior here, and C shows the rate of microwave.
[0017] With this operation gestalt, the supporter material 4 is made to support two lamps 5a and 5b, and each is arranged in the part of the antinode of a standing wave for the field strength in the cavernous configuration member 2 to become large here.
[0018] Moreover, both, two lamps 5a and 5b of this operation gestalt are the same specifications, and they are formed so that the amount of the magnitude of an arc tube, the construction material of an arc tube, the gas enclosed within luminescence, and said gas may spread abbreviation etc. and may become mutually, respectively.
[0019] With such this operation gestalt, if microwave is generated from the microwave power source 1, the RF electric field by the standing wave will be impressed to the two above-mentioned lamps 5a and 5b. Without two lamps 5a and 5b starting discharge simultaneously, when there is a difference also in the field strength in the location where a difference is in the ease of start up in, respectively even if Lamps 5a and 5b are the same specifications mutually, and Lamps 5a and 5b have been arranged, it is easy to put while into operation, and for example, lamp 5a starts discharge previously.
[0020] The plasma occurs and the energy of microwave is concentrated on lamp 5a within [of lamp 5a which started discharge] luminescence. Consequently, the Q value of the cavernous configuration member 2 interior falls rapidly, and field strength required for discharge starting is no longer obtained to lamp 5b. Thereby, only lamp 5a which is easy to put into operation lights up with the energy of microwave.
[0021] By the way, the temperature of lamp 5a becomes high by burning, and the vapor pressure within [in lamp 5a] luminescence also becomes high. On the other hand, although lamp 5b receives heat from lamp 5a by radiation etc., since the heating value is small, the temperature of lamp 5b is more remarkably [than lamp 5a] low, and most vapor pressure within luminescence is not rising.
[0022] When switch off lamp 5a in such the condition, it makes it turn on among Lamps 5a and 5b again any they are and microwave is generated from the microwave power source 1 as like, since the starting voltage of a lamp carries out proportionally [abbreviation] at the vapor pressure within luminescence, the light is not switched on but lamp 5b with low vapor pressure turns on lamp 5a with high vapor pressure.
[0023] thus, when generating microwave from the microwave power source 1 with this operation gestalt by having arranged two lamps 5a and 5b into the part of the antinode of a standing wave It can concentrate on each lamps 5a and 5b, and the energy by microwave can be impressed efficiently. When generating microwave again immediately after only one LGT's being able to make lamp 5a which is easy to put into operation among Lamps 5a and 5b turn on easily previously, and switching off lamp 5a, vapor pressure can make comparatively low lamp 5b able to turn on, and can make restart easy.
[0024] Moreover, when a user makes lamp 5a which is easy to put into operation among Lamps 5a and 5b turn on, desired lamp 5a can be made to turn on by generating microwave from the microwave power source 1 like ****. And microwave is again generated immediately after having stopped microwave and making lamp 5a switch off like above-

mentioned restart, when making lamp 5b which is hard to put into operation turn on, after generating microwave from the microwave power source 1 first, making lamp 5a turn on and the vapor pressure of lamp 5a becoming high after a while. Desired lamp 5b can be made to turn on, without this requiring a start-up auxiliary means like the conventional example.

[0025] By the way, with this operation gestalt, although it had two lamps, you may have three or more. When the number of a lamp is two, since the vapor pressure of each lamp is high after a limitation is possible for above-mentioned restart at once and restarting it once at once, the 2nd restart becomes difficult. That is, the count which can be restarted can be made [many] and user-friendliness can be improved, so that it has three or more lamps and the number of a lamp is made [many], since restart of a time will be attained if the number of the lamp which it had is n pieces (n-1). moreover, when making the lamp which is hard to put into operation among three or more lamps turn on By generating the microwave from the microwave power source 1 intermittently so that restart may be repeated If many repeat restart of a time (n-1), a desired lamp can be made to surely turn on, if the order which is easy to put one LGT of two or more lamps into operation at a time can be switched on, a desired lamp can be made to turn on with an easy configuration and it has n lamps. The life of such a synthetic lamp can be lengthened that there is much number of a lamp by making only one LGT turn on among further two or more lamps.

[0026] Moreover, since only the location of the lamp to turn on is changed when you make it turn on one LGT of lamps 5a and 5b at a time by having made the same the specification of Lamps 5a and 5b, respectively, luminous intensity distribution can be controlled by this operation gestalt, without moving this, for example using a reflecting mirror etc.

(Operation gestalt 2) Since it is common in the operation gestalt 1, the basic configuration in this operation gestalt attaches the sign same about a part in common, omits explanation, and it explains it to a detail only about the part used as the description of this operation gestalt.

[0027] With this operation gestalt, the description is in the point of generating the standing wave which has one antinode in the cavernous configuration member 2.

[0028] For example, as shown in drawing 2 (a), in the cavernous configuration member 2, the standing wave which has one antinode is generated, two lamps 5a and 5b are supported to each ** by two supporter material 4a and 4a, respectively, and it arranges at the part of said antinode. Moreover, one supporter material 4b may be made to support two lamps 5a and 5b, and supporter material 4b may be made to support three lamps 5a, 5b, and 5c, as are shown in drawing 2 (b), and shown in drawing 2 (c). Furthermore, supporter material 4c may be made to support Lamps 5a and 5b so that two lamps 5a and 5b may be arranged by the part of the antinode of a standing wave along the travelling direction of microwave as shown in drawing 2 (d).

[0029] Thus, with this operation gestalt, by setting the antinode of a standing wave to one, magnitude of the cavernous configuration member 2 can be made into min, and the miniaturization of the whole equipment can be attained.

(Operation gestalt 3) Since it is common in the operation gestalt 1 or 2, the basic configuration in this operation gestalt attaches the sign same about a part in common, omits explanation, and it explains it to a detail only about the part used as the description of this operation gestalt.

[0030] With this operation gestalt, as shown, for example in drawing 3 (a), the standing wave which has two antinodes in the cavernous configuration member 2 is generated, and the description is that it arranged Lamps 5a and 5b at the part of each antinode.

[0031] Thus, with this operation gestalt, by setting the antinode of a standing wave to two, the magnitude of the cavernous configuration member 2 can be stopped comparatively small, and the miniaturization of the whole equipment can be attained.

[0032] Moreover, as shown in drawing 4 , it may have the reflecting mirror 9 surrounding the perimeter of the cavernous configuration member 2 so that only the longitudinal direction end side of the cavernous configuration member 2 may be opened, and luminous intensity distribution may be adjusted so that the light from Lamps 5a and 5b may be turned to said longitudinal direction end side of the cavernous configuration member 2. And with this operation gestalt, a luminous-intensity-distribution property can be changed from the difference in the location of the lamp to turn on a lot than the operation gestalt 2 by having arranged Lamps 5a and 5b in the part of each antinode of a standing wave.

(Operation gestalt 4) Since it is common in the operation gestalten 1-3, the configuration in this operation gestalt attaches the sign same about a part in common, omits explanation, and it explains it to a detail only about the part used as the description of this operation gestalt.

[0033] With this operation gestalt, the description is in the point of having changed the specification of Lamps 5a and 5b mutually. That is, at least one is mutually changed of the amounts of the magnitude of an arc tube, the construction material of an arc tube, the gas enclosed within luminescence, and said gas to Lamps 5a and 5b.
[0034] Thereby, with this operation gestalt, optical properties, such as a color or a color temperature, color rendering properties, lamp efficiency, and an optical output, can be made adjustable because you make it turn on one LGT of lamps 5a and 5b at a time.
[0035] For example, the color temperature of lamp 5a is 3000 [K], and if the color temperature of lamp 5b is 5000 [K], a color temperature can be made adjustable because you make it turn on one LGT of lamps 5a and 5b at a time. Moreover, since it is difficult to reconcile high lamp efficiency and high color rendering properties on one lamp generally, when what has high lamp efficiency is used for lamp 5a and color rendering properties use a high thing for lamp 5b, by switching Lamps 5a and 5b and making the light switch on if needed, lamp efficiency can be raised or color rendering properties can be raised.
[0036] Furthermore, you may have three or more lamps with which specifications differ mutually also in this operation gestalt, and an optical property can be made adjustable with an easy configuration according to the number of the lamp which it had at this time.
[0037] For example, mutually, when it has the construction material of an arc tube, and three lamps which the gas enclosed with an arc tube is changed and are turned on with red and a blue and green light color, respectively, a light color can be made adjustable by switching said three lamps and making the light switch on.
(Operation gestalt 5) Since it is common in the operation gestalten 1-4, the basic configuration in this operation gestalt attaches the sign same about a part in common, omits explanation, and it explains it to a detail only about the part used as the description of this operation gestalt.
[0038] Although the clearance was left and Lamps 5a and 5b were independently arranged with the operation gestalten 1-4, respectively The space which prepared bridge wall 6b which bisects the interior in outer-tube 6a which consists of a translucency ingredient which encloses gas, such as mercury, and was being steadily bisected by bridge wall 6b with this operation gestalt as shown in drawing 5 (a) and (b), Lamp 5a is constituted from a part of outer-tube 6a surrounding this space, and bridge wall 6b, and bridge wall 6b to the space of another side, a part of outer-tube 6a surrounding this space, and lamp 5b are constituted. Thus, bridge wall 6b which becomes a part of each arc tube is made to share mutually to Lamps 5a and 5b.
[0039] Thereby, with this operation gestalt, even if it can bring close and arrange said two lamps 5a and 5b, without leaving a clearance and you make it turn on one LGT of each of two lamps 5a and 5b at a time, a luminous-intensity-distribution property can be maintained at abbreviation regularity. Here, when gas which is mutually different, for example is enclosed with each of two space prepared by bridge wall 6b of outer-tube 6a, only an optical property can be made adjustable because you make it turn on one LGT of lamps 5a and 5b at a time, respectively.
[0040] By the way, with this operation gestalt, although it had two lamps 5a and 5b, as shown in drawing 5 (c), you may have three lamps 5a, 5b, and 5c by establishing bridge walls 6c, 6d, and 6e, and forming three space in outer-tube 6a.
[0041] In this case, the arc tube of lamp 5a consists of the part and bridge walls 6c and 6d of outer-tube 6a, the arc tube of lamp 5b consists of the part and bridge walls 6c and 6e of outer-tube 6a, and the arc tube of lamp 5c consists of the part and bridge walls 6d and 6e of outer-tube 6a. That is, make bridge wall 6c share with Lamps 5a and 5b, bridge wall 6e is made to share with Lamps 5b and 5c, and 6d of bridge walls is made to share with Lamps 5c and 5a.
[0042] Although bridge wall 6b was prepared in one outer-tube 6a and bridge wall 6b was made to share to each of Lamps 5a and 5b with this operation gestalt furthermore Lamps 5a and 5b are alike, respectively, it may receive and the tube walls 6d and 6d which have said whole surface in each arc tube may be made to contact mutually the whole surface of the arc tube of each lamps 5a and 5b, and to share, as shown in drawing 5 (d)
(Operation gestalt 6) Since it is common in the operation gestalten 1-4, the basic configuration in this operation gestalt attaches the sign same about a part in common, omits explanation, and it explains it to a detail only about the part used as the description of this operation gestalt.
[0043] Although the clearance was left and Lamps 5a and 5b were independently arranged with the operation gestalten 1-4, respectively, as shown in drawing 6 (a) - (c), lamp 5b is stored within [of lamp 5a] luminescence with this operation gestalt.
[0044] Thereby, with this operation gestalt, even if it can bring close and arrange said two lamps 5a and 5b, without

leaving a clearance and you make it turn on one LGT of each of two lamps 5a and 5b at a time, a luminous-intensity-distribution property can be maintained at abbreviation regularity.
[0045] moreover, it is shown in drawing 6 (a) and (b) -- as -- the mutual core of Lamps 5a and 5b -- abbreviation -- the time of changing the location of a mutual core, as shown in drawing 6 (c) when it has arranged in the same location -- comparing -- a luminous-intensity-distribution property -- further -- abbreviation -- it can be kept constant.
[0046] by the way, with this operation gestalt, although it had two lamps 5a and 5b, it is shown in drawing 6 (d) -- as -- the luminescence within the pipe one of lamp 5b -- further -- lamp 5c -- storing -- the mutual core of Lamps 5a, 5b, and 5c -- abbreviation -- you may arrange in the same location.
In (the operation gestalt 7) and time, with the operation gestalten 1-6, when you are going to make it turn on lamp 5b which is hard to put into operation compared with lamp 5a among Lamps 5a and 5b, in order to make lamp 5a turn on and switch off previously, operating the microwave power source 1, having to generate and stop microwave and operating the microwave power source 1 will take time and effort.
[0047] So, with this operation gestalt, as shown in drawing 7 , it has the control circuit 20 which controls the microwave power source 1, and the directions switch 10 directed to make any or one LGT turn on among Lamps 5a and 5b to a control circuit 20.
[0048] Moreover, the microwave power source 1 is equipped with principal piece 1a which generates microwave, and switch 1b which generates or stops microwave from principal piece 1a.
[0049] It is that the control circuit 20 is equipped with the storage section which memorizes each sequence of Lamps 5a and 5b which is easy to put into operation, and a user operates the directions switch 10. If directed to make for example, lamp 5b turn on from the directions switch 10 Based on said sequence memorized by the storage section, it distinguishes that it is easy to put lamp 5b into operation to the 2nd, and switch 1b of the microwave power source 1 is turned on / turned off, and microwave is generated and stopped from principal piece 1a so that lamp 5a may light up and put out the light previously. Then, a control circuit 20 turns on switch 1b again, makes principal piece 1a generate microwave, and makes it turn on lamp 5b.
[0050] Thus, time and effort which operates the microwave power source 1 in order to make lamp 5a turn on and switch off can be saved only by operating the directions switch 10 so that a user may make lamp 5b turn on, and lamp 5b can be made to turn on easily with this operation gestalt. On the other hand, when the directions switch 10 is operated so that a user may make lamp 5a turn on, a control circuit 20 distinguishes that it is easy to put into operation lamp 5a directed from the directions switch 10 to the 1st based on said sequence memorized by the storage section, turns on switch 1b of the microwave power source 1 on it only once, and makes it turn on lamp 5a.
[0051] Moreover, although it had two lamps 5a and 5b, it may have and the storage section of a control circuit 20 may be made to memorize for a lamp three or more sequence which each lamp tended to put into operation with this operation gestalt. At this time, like ****, a control circuit 20 If directed to make a predetermined lamp turn on from the directions switch 10 Based on said sequence memorized by the storage section, it distinguishes that it is easy to put said predetermined lamp into operation to the n-th. Microwave is intermittently generated from the microwave power source 1 so that the lamp which others tend to put into operation previously may turn on only one LGT only of times at a time one by one (n-1), microwave is generated again and said predetermined lamp is made to turn on after that.
[0052] Thereby, many time and effort which operates the microwave power source 1 can be saved, and said lamp can be made to turn on easily with this operation gestalt, so that it is hard to put into operation the lamp which there tends to be much number of the lamp which it had and tends to make it turn on also in it.
(Operation gestalt 8) Since it is common in the operation gestalt 7, the basic configuration in this operation gestalt attaches the sign same about a part in common, omits explanation, and it explains it to a detail only about the part used as the description of this operation gestalt.
[0053] With this operation gestalt, it has the control circuit 20 which controls the microwave power source 1, the directions switch 10 directed to make any or one LGT turn on among Lamps 5a and 5b to a control circuit 20, the temperature sensing element 31 which detects the temperature of the lamp 5a circumference and outputs a temperature signal, and the temperature sensing element 32 which detects the temperature of the lamp 5b circumference and outputs a temperature signal.
[0054] This operation gestalt constitutes the burning detection means from the temperature sensing elements 31 and 32 and a control circuit 20 here. That is, the control circuit 20 of this operation gestalt measures the temperature of lamp 5a and 5b circumference from the temperature signal from the temperature sensing elements 31 and 32. When the

temperature of the lamp 5a circumference was higher than the temperature of the lamp 5b circumference and it distinguishes, burning of lamp 5a is detected, and conversely, when the temperature of the lamp 5b circumference was higher than the temperature of the lamp 5a circumference conversely and it distinguishes conversely, burning of lamp 5b is detected.

[0055] And the control circuit 20 of this operation gestalt turns on switch 1b of the microwave power source 1, generates microwave from principal piece 1a, after making lamp 5a which is easy to put into operation rather than lamp 5b previously turn on, stops microwave and makes lamp 5a switch off, when directed to make lamp 5b turn on from the directions switch 10. And a control circuit 20 generates microwave from the microwave power source 1 again, and makes lamp 5b turn on. At this time, a control circuit 20 detects that lamp 5b directed from the directions switch 10 lit up based on the temperature signal from the temperature sensing elements 31 and 32, continues generating microwave from the microwave power source 1, and maintains lamp 5b at a burning condition.

[0056] Thus, like the operation gestalt 7, time and effort which operates the microwave power source 1 in order to make lamp 5a turn on and switch off can be saved only by operating the directions switch 10 so that a user may make lamp 5b turn on, and lamp 5b can be made to turn on easily with this operation gestalt. On the other hand, when the directions switch 10 is operated so that a user may make lamp 5a turn on, a control circuit 20 generates microwave from the microwave power source 1, and makes lamp 5a turn on ahead of lamp 5b. At this time, a control circuit 20 detects that lamp 5a directed from the directions switch 10 lit up based on the temperature signal from the temperature sensing elements 31 and 32, continues generating microwave from the microwave power source 1, and maintains lamp 5a at a burning condition.

[0057] Moreover, also in this operation gestalt, when what has high lamp efficiency is used for lamp 5a and the high thing of color rendering properties is used for lamp 5b like the operation gestalt 4, the directions switch 10 is operated if needed, by switching Lamps 5a and 5b and making the light switch on, lamp efficiency can be raised or color rendering properties can be raised.

[0058] By the way, many time and effort which operates the microwave power source 1 can be saved, and said lamp can be made to turn on easily with this operation gestalt, although it had two lamps 5a and 5b, so that the lamp which there tends to be much number of three or more lamps which could have and it had, and tends to make it turn on also in it cannot put a lamp into operation easily like the operation gestalt 7.

[0059] Although the burning detection means was furthermore constituted from this operation gestalt using two temperature sensing elements 31 and 32, you may make it detect based on the output from each photo detector using two photo detectors which detect the optical output from Lamps 5a and 5b to instead of [these] whether which lamps 5a and 5b are on to the control circuit 20.

[0060] In addition, the configuration of Lamps 5a and 5b and the cavernous configuration member 2 is not limited to the configuration in this operation gestalt, and the location of the lamps 5a and 5b in the cavernous configuration member 2 is not limited to the location in this operation gestalt, either.

[0061]

[Effect of the Invention] The microwave power source which invention of claim 1 generates microwave and is supplied as a power source, Since it had the cavernous configuration member which makes the interior generate a standing wave by the microwave generated from the microwave power source, and two or more electrodeless discharge LGTs arranged by the part of the antinode of said standing wave When generating microwave from a microwave power source It can concentrate on each electrodeless discharge LGT, and the energy by microwave can be impressed efficiently. Only one LGT can make the electrodeless discharge LGT which is the easiest to put into operation among two or more electrodeless discharge LGTs turn on easily previously. When generating microwave from a microwave power source again immediately after making said electrodeless discharge LGT switch off While only one LGT can make a comparatively low electrodeless discharge LGT able to turn on and the vapor pressure different from said electrodeless discharge LGT with which the vapor pressure within luminescence became high by having switched on the light within luminescence can make restart easy By making it generate intermittently, microwave from a microwave power source so that said restart may be repeated By carrying out sequential burning of one every LGT of two or more electrodeless discharge LGTs, being able to make a desired electrodeless discharge LGT turn on with an easy configuration, without requiring a start-up auxiliary means like the conventional example, and making only one LGT turn on among two or more electrodeless discharge LGTs It is effective in the ability to lengthen the life of a synthetic electrodeless discharge LGT.

[0062] Since invention of claim 2 generates the standing wave which has one antinode in a cavernous configuration member, it is effective in the ability to make magnitude of a cavernous configuration member into min, and attain the miniaturization of the whole equipment.
[0063] Since invention of claim 3 generated the standing wave which has two antinodes and arranged the electrodeless discharge LGT in the cavernous configuration member at the part of each antinode While being able to stop the magnitude of a cavernous configuration member comparatively small and being able to attain the miniaturization of the whole equipment by setting the antinode of a standing wave to two By having arranged the electrodeless discharge LGT in the part of each antinode of a standing wave, it is effective in the ability to change a luminous-intensity-distribution property a lot than invention of claim 2 from the difference in the location of the electrodeless discharge LGT turned on for every antinode.
[0064] Since invention of claim 4 changed mutually at least one of the amounts of the magnitude of an arc tube, the construction material of an arc tube, the enclosure object within luminescence, and said enclosure object to two or more electrodeless discharge LGTs, it makes it turn on one LGT of said two or more electrodeless discharge LGTs at a time, and is effective in the ability to make adjustable optical properties, such as a color or a color temperature, color rendering properties, lamp efficiency, and an optical output.
[0065] Since invention of claim 5 made some arc tubes share mutually to any or two electrodeless discharge LGTs among two or more electrodeless discharge LGTs Even if it can bring close and arrange said two electrodeless discharge LGTs, without leaving a clearance, consequently you make it turn on one LGT of each of said two electrodeless discharge LGTs at a time, it is effective in the ability to maintain a luminous-intensity-distribution property at abbreviation regularity.
[0066] invention of claim 6 -- the inside of two or more electrodeless discharge LGTs -- the luminescence within the pipe one of at least one electrodeless discharge LGT -- other electrodeless discharge LGTs -- storing -- the core of said two electrodeless discharge LGTs -- abbreviation, since it has arranged in the same location the core of said two electrodeless discharge LGTs -- abbreviation -- even if you make it turn on one LGT of each of said two electrodeless discharge LGTs at a time by having arranged in the same location -- a luminous-intensity-distribution property -- abbreviation -- it is effective in the ability to keep it constant.
[0067] Invention of claim 7 is equipped with a storage means to memorize each sequence of two or more electrodeless discharge LGTs which is easy to put into operation, and the control means which controls a microwave power source. Said control means If directed to make a predetermined electrodeless discharge LGT turn on, based on said sequence memorized by the storage means It distinguishes that it is the electrodeless discharge LGT which said electrodeless discharge LGT tends to put into operation to the n-th. Since make a microwave power source generate microwave intermittently so that which electrodeless discharge LGT may turn on and switch off only a time (n-1), a microwave power source is made to generate microwave again after that and said predetermined electrodeless discharge LGT is made to turn on In order for a user to do sequential burning of one every LGT of two or more electrodeless discharge LGTs only by directing a desired electrodeless discharge LGT to a control means, time and effort which operates a microwave power source is saved, and there is effectiveness of the ability to make a desired electrodeless discharge LGT turn on easily each time.
[0068] Invention of claim 8 is equipped with a burning detection means to detect burning of at least one predetermined electrodeless discharge LGT, and the control means which controls a microwave power source. Said control means Since microwave is intermittently generated from a microwave power source so that which electrodeless discharge LGT may light up and put out the light until said burning detection means detects burning When a user makes a desired electrodeless discharge LGT turn on, in order to carry out sequential burning of one every LGT of two or more electrodeless discharge LGTs, time and effort which operates a microwave power source is saved, and there is effectiveness of the ability to make a desired electrodeless discharge LGT turn on easily each time.

[Translation done.]

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EFFECT OF THE INVENTION

[Effect of the Invention] The microwave power source which invention of claim 1 generates microwave and is supplied as a power source, Since it had the cavernous configuration member which makes the interior generate a standing wave by the microwave generated from the microwave power source, and two or more electrodeless discharge LGTs arranged by the part of the antinode of said standing wave When generating microwave from a microwave power source It can concentrate on each electrodeless discharge LGT, and the energy by microwave can be impressed efficiently. Only one LGT can make the electrodeless discharge LGT which is the easiest to put into operation among two or more electrodeless discharge LGTs turn on easily previously. When generating microwave from a microwave power source again immediately after making said electrodeless discharge LGT switch off While only one LGT can make a comparatively low electrodeless discharge LGT able to turn on and the vapor pressure different from said electrodeless discharge LGT with which the vapor pressure within luminescence became high by having switched on the light within luminescence can make restart easy By making it generate intermittently, microwave from a microwave power source so that said restart may be repeated By carrying out sequential burning of one every LGT of two or more electrodeless discharge LGTs, being able to make a desired electrodeless discharge LGT turn on with an easy configuration, without requiring a start-up auxiliary means like the conventional example, and making only one LGT turn on among two or more electrodeless discharge LGTs It is effective in the ability to lengthen the life of a synthetic electrodeless discharge LGT.
[0062] Since invention of claim 2 generates the standing wave which has one antinode in a cavernous configuration member, it is effective in the ability to make magnitude of a cavernous configuration member into min, and attain the miniaturization of the whole equipment.
[0063] Since invention of claim 3 generated the standing wave which has two antinodes and arranged the electrodeless discharge LGT in the cavernous configuration member at the part of each antinode While being able to stop the magnitude of a cavernous configuration member comparatively small and being able to attain the miniaturization of the whole equipment by setting the antinode of a standing wave to two By having arranged the electrodeless discharge LGT in the part of each antinode of a standing wave, it is effective in the ability to change a luminous-intensity-distribution property a lot than invention of claim 2 from the difference in the location of the electrodeless discharge LGT turned on for every antinode.
[0064] Since invention of claim 4 changed mutually at least one of the amounts of the magnitude of an arc tube, the construction material of an arc tube, the enclosure object within luminescence, and said enclosure object to two or more electrodeless discharge LGTs, it makes it turn on one LGT of said two or more electrodeless discharge LGTs at a time, and is effective in the ability to make adjustable optical properties, such as a color or a color temperature, color rendering properties, lamp efficiency, and an optical output.
[0065] Since invention of claim 5 made some arc tubes share mutually to any or two electrodeless discharge LGTs among two or more electrodeless discharge LGTs Even if it can bring close and arrange said two electrodeless discharge LGTs, without leaving a clearance, consequently you make it turn on one LGT of each of said two electrodeless discharge LGTs at a time, it is effective in the ability to maintain a luminous-intensity-distribution property at abbreviation regularity.
[0066] invention of claim 6 -- the inside of two or more electrodeless discharge LGTs -- the luminescence within the pipe one of at least one electrodeless discharge LGT -- other electrodeless discharge LGTs -- storing -- the core of said two electrodeless discharge LGTs -- abbreviation, since it has arranged in the same location the core of said two

electrodeless discharge LGTs -- abbreviation -- even if you make it turn on one LGT of each of said two electrodeless discharge LGTs at a time by having arranged in the same location -- a luminous-intensity-distribution property -- abbreviation -- it is effective in the ability to keep it constant.

[0067] Invention of claim 7 is equipped with a storage means to memorize each sequence of two or more electrodeless discharge LGTs which is easy to put into operation, and the control means which controls a microwave power source. Said control means If directed to make a predetermined electrodeless discharge LGT turn on, based on said sequence memorized by the storage means It distinguishes that it is the electrodeless discharge LGT which said electrodeless discharge LGT tends to put into operation to the n-th. Since make a microwave power source generate microwave intermittently so that which electrodeless discharge LGT may turn on and switch off only a time (n-1), a microwave power source is made to generate microwave again after that and said predetermined electrodeless discharge LGT is made to turn on In order for a user to do sequential burning of one every LGT of two or more electrodeless discharge LGTs only by directing a desired electrodeless discharge LGT to a control means, time and effort which operates a microwave power source is saved, and there is effectiveness of the ability to make a desired electrodeless discharge LGT turn on easily each time.

[0068] Invention of claim 8 is equipped with a burning detection means to detect burning of at least one predetermined electrodeless discharge LGT, and the control means which controls a microwave power source. Said control means Since microwave is intermittently generated from a microwave power source so that which electrodeless discharge LGT may light up and put out the light until said burning detection means detects burning When a user makes a desired electrodeless discharge LGT turn on, in order to carry out sequential burning of one every LGT of two or more electrodeless discharge LGTs, time and effort which operates a microwave power source is saved, and there is effectiveness of the ability to make a desired electrodeless discharge LGT turn on easily each time.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, with the above-mentioned conventional microwave electrodeless discharge LGT equipment, since electromagnetic field were impressed to the whole lamp which has two or more discharge space with the induction coil, the energy of electromagnetic field distributes to each discharge space, and it was hard to concentrate it, and in order to concentrate energy on desired discharge space and to switch it on, there was a problem of requiring the start-up auxiliary means which impresses a high voltage pulse to said discharge space.
[0005] Moreover, a lamp is a high intensity discharge lamp (HID lamp), and the starting voltage of a lamp carries out proportionally [abbreviation] at the vapor pressure within luminescence. For this reason, when discharge space of a lamp was set to one, even if it could centralize the energy of electromagnetic field on said discharge space, since the temperature of a lamp was high immediately after putting out lights of a lamp and the vapor pressure within luminescence also had it to it, unless starting voltage became high, and it put out the light and waited several minutes, it could not restart, but there was a problem that the restart immediately after putting out lights became difficult. [high]
[0006] The microwave electrodeless discharge LGT equipment which this invention is [equipment] easy to restart for the purpose of solution of the above-mentioned trouble, and makes one desired LGT turn on with an easy configuration among two or more electrodeless discharge LGTs is offered.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the outline block diagram showing the operation gestalt 1.
[Drawing 2] (a) - (d) is the important section outline block diagram showing the operation gestalt 2.
[Drawing 3] It is the important section outline block diagram showing the operation gestalt 3.
[Drawing 4] They are other important section outline block diagrams same as the above.
[Drawing 5] (a) - (d) is the outline block diagram showing the electrodeless discharge LGT of the operation gestalt 5.
[Drawing 6] (a) - (d) is the outline block diagram showing the electrodeless discharge LGT of the operation gestalt 6.
[Drawing 7] It is the outline block diagram showing the operation gestalt 7.
[Drawing 8] It is the outline block diagram showing the operation gestalt 8.
[Description of Notations]
1 Microwave Power Source
2 Cavernous Configuration Member
3 Waveguide
5a, 5b Electrodeless discharge LGT

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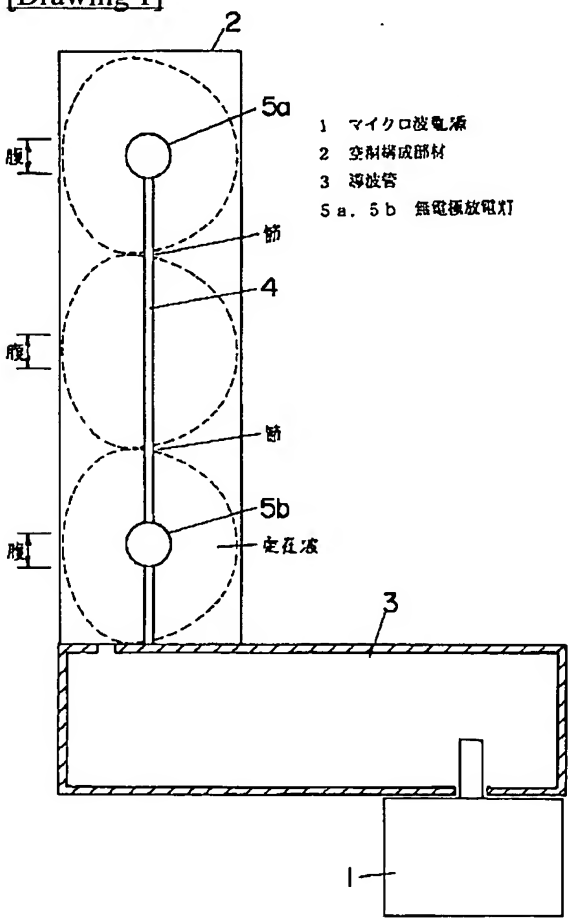
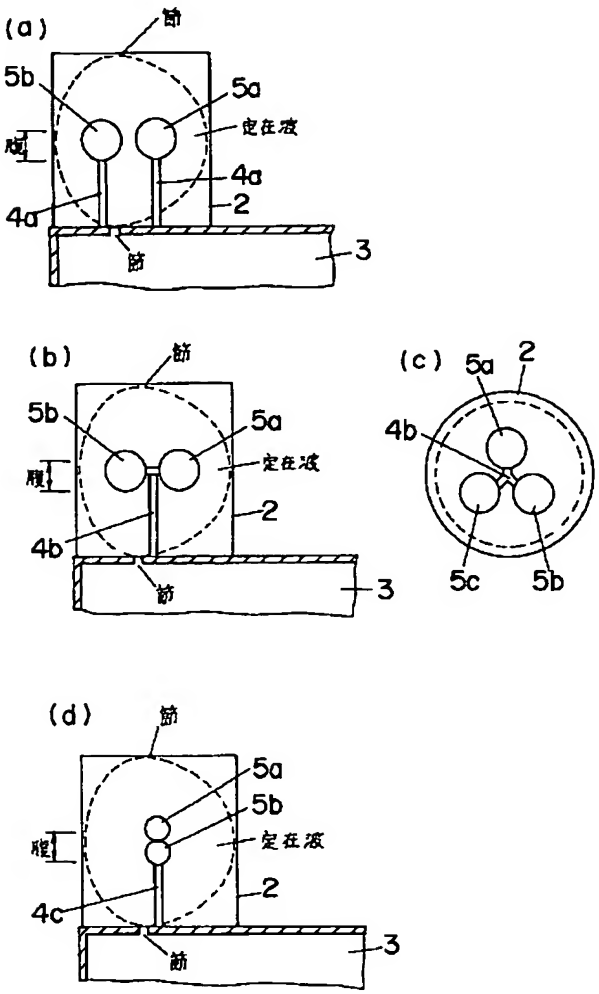
DRAWINGS

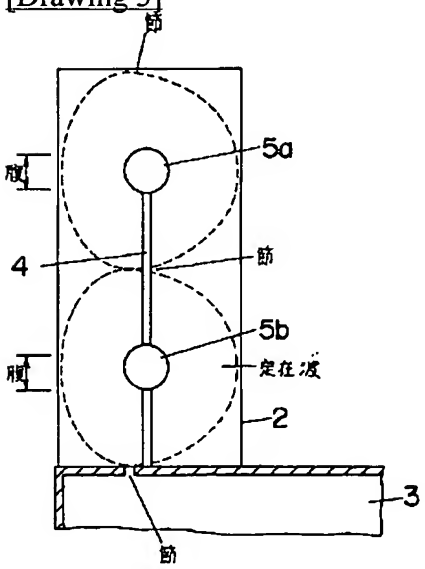
[Drawing 1]



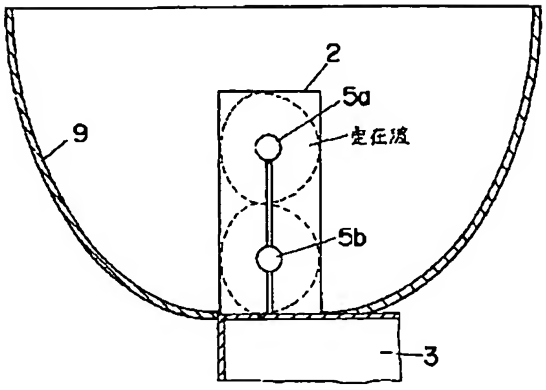
[Drawing 2]



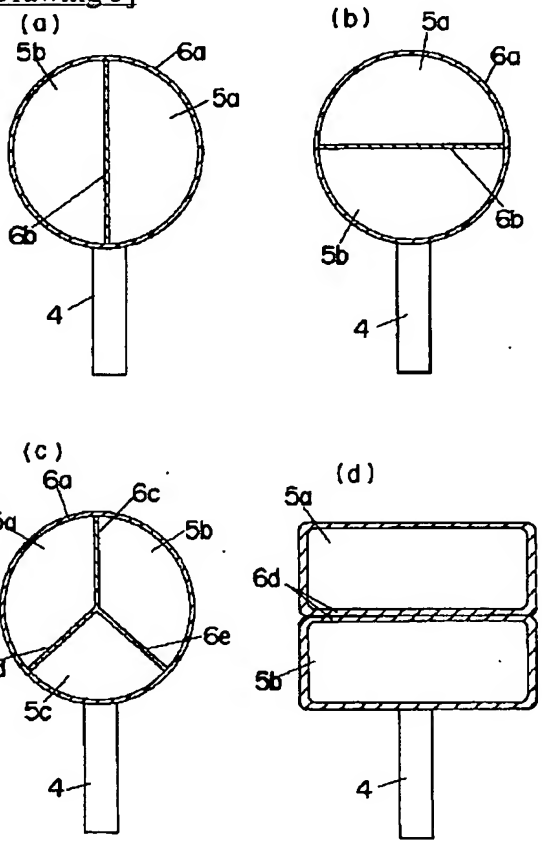
[Drawing 3]



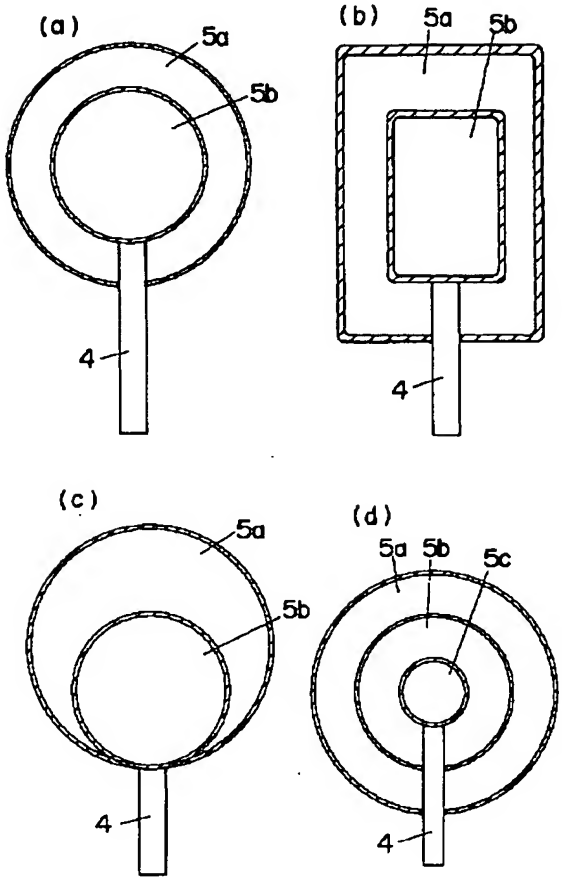
[Drawing 4]



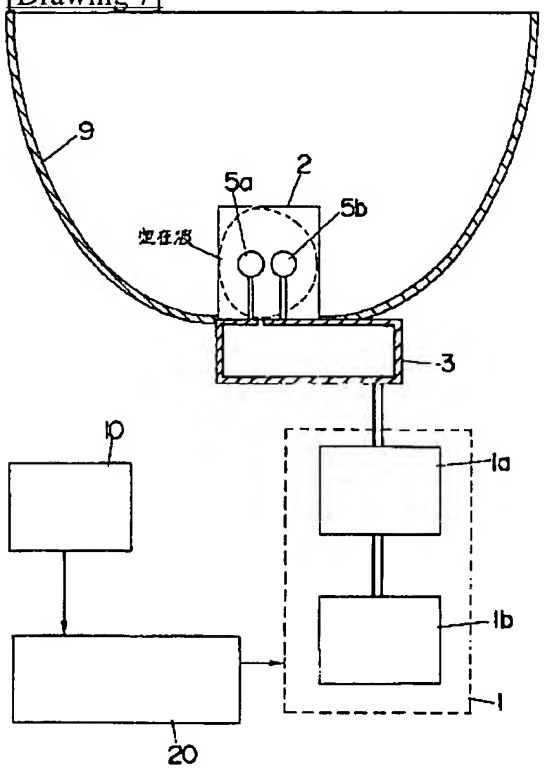
[Drawing 5]



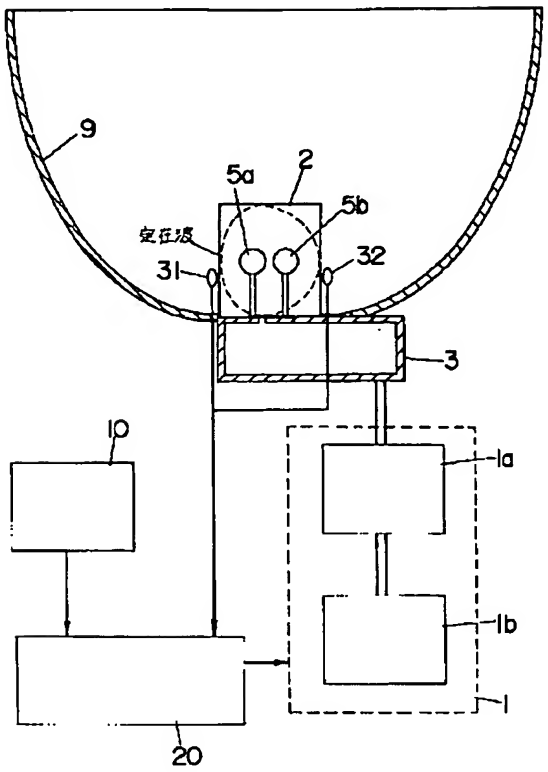
[Drawing 6]



[Drawing 7]



[Drawing 8]



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CLAIMS

[Claim(s)]
[Claim 1] Microwave electrodeless discharge LGT equipment characterized by having the microwave power source which generates microwave and is supplied as a power source, the cavernous configuration member which makes the interior generate a standing wave by the microwave generated from the microwave power source, and two or more electrodeless discharge LGTs arranged by the part of the antinode of said standing wave.
[Claim 2] Microwave electrodeless discharge LGT equipment according to claim 1 characterized by generating the standing wave which has one antinode in a cavernous configuration member.
[Claim 3] Microwave electrodeless discharge LGT equipment according to claim 1 characterized by having generated the standing wave which has two antinodes and arranging an electrodeless discharge LGT in a cavernous configuration member at the part of each antinode.
[Claim 4] Microwave electrodeless discharge LGT equipment given in any of claims 1-3 characterized by changing mutually at least one of the amounts of the magnitude of an arc tube, the construction material of an arc tube, the enclosure object within luminescence, and said enclosure object to two or more electrodeless discharge LGTs they are.
[Claim 5] Microwave electrodeless discharge LGT equipment given in any of claims 1-4 characterized by making some arc tubes share mutually to any or two electrodeless discharge LGTs among two or more electrodeless discharge LGTs.

[Claim 6] the inside of two or more electrodeless discharge LGTs -- the luminescence within the pipe one of at least one electrodeless discharge LGT -- other electrodeless discharge LGTs -- storing -- the core of said two electrodeless discharge LGTs -- abbreviation -- microwave electrodeless discharge LGT equipment given in any of claims 1-4 characterized by having arranged in the same location they are.
[Claim 7] It has a storage means to memorize each sequence of two or more electrodeless discharge LGTs which is easy to put into operation, and the control means which controls a microwave power source. Said control means If directed to make a predetermined electrodeless discharge LGT turn on, based on said sequence memorized by the storage means It distinguishes that it is the electrodeless discharge LGT which said electrodeless discharge LGT tends to put into operation to the n-th. A microwave power source is made to generate microwave intermittently so that which electrodeless discharge LGT may turn on and switch off only a time (n-1). Then, microwave electrodeless discharge LGT equipment given in any of claims 1-6 characterized by making a microwave power source generate microwave and making it turn on said predetermined electrodeless discharge LGT again they are.
[Claim 8] It is microwave electrodeless-discharge LGT equipment given in any of claims 1-6 which are equipped with a burning detection means detect burning of at least one predetermined electrodeless discharge LGT, and the control means which controls a microwave power source, and are characterized by to generate microwave intermittently from a microwave power source so that which electrodeless-discharge LGT may turn on and switch off said control means until said burning detection means detects burning.

[Translation done.]